

## ABSTRACT

A flip chip method of joining a chip and a substrate is described. A thermo-compression bonder is utilized to align the chip and substrate and apply a contact force to hold solder bumps on the substrate against metal bumps on the chip. The chip is rapidly  
5 heated from its non-native side by a pulse heater in the head of the bonder until the re-flow temperature of the solder bumps is reached. Proximate with reaching the re-flow temperature at the solder bumps, the contact force is released. The solder is held above its re-flow temperature for several seconds to facilitate wetting of the substrate's metal protrusions and joining. A no-clean flux that has a volatilization temperature below the  
10 melting point of the solder bumps is utilized to minimize or eliminate the need for a post interconnection de-flux operation.